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ABSTRACT

This symposium on conflict management and decision making is comprised of three papers. "Two Approaches to Conflict Management in Teams: A Case Study" (Mychal Coleman, Gary N. McLean) describes a study that provided conflict management training to two employee teams using the traditional lecture method and cooperative learning (CL). (Initially, both groups were optimistic about their conflict management skills; in follow up, only the CL group remained optimistic. The traditional group was less optimistic, primarily because of a lack of management support. Both approaches appeared to be effective.) "A Force-Field Analysis of Factors Affecting Men and Women Choosing to Become Professional Pilots" (Steven L. Anderson) focuses on a study to identify factors that could influence people to enter fields where there are critical shortages and lists 20 factors identified as having significantly different importance to the recruitment of men and women. "Decision-Making Processes in Novice and Expert Airplane Pilots" (Edward L. Deitch, Albert K. Wiswell) reports these study findings: experts exhibited characteristics and themes that differed noticeably from those of novices; experts used cognitive maps effectively in attempting to cope with problems; and novices used cognitive maps in decision-making processes, but their maps were primitive in comparison to the experts and resulted in difficulties when attempting to address specific scenarios. All papers contained significant references. (YLB)

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# 2002 AHRD Conference

# Conflict Management and Decision Making

## Symposium 33

## Honolulu, Hawaii

## February 27 - March 3, 2002

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# Two Approaches to Conflict Management in Teams: A Case Study

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*Two employee teams received conflict management training using lecture and exercises, and cooperative learning. A survey was administered at the end of training and three months later. After three months, observations were made and management interviewed. Initially, both groups were optimistic about their conflict management skills. In follow-up, only the cooperative learning group remained optimistic; the traditional group was less optimistic, primarily because of a lack of management support. Both approaches appear to be effective.*

Keywords: Conflict Management, Team Building, Cooperative Learning

This paper describes and interprets two intervention strategies, a cooperative learning (CL) interactive approach to conflict management and a conflict management seminar taught under the traditional lecture method. These interventions were offered to two start-up self-directed work teams (SDWT) in a mid-sized surface-to-air medical trauma company

The use of teams in organizations continues to grow rapidly. Joinson (1999) reported that the Center for the Study of Work Teams indicated that by the year 2000 80% of the Fortune 500 organizations would have half of their employees on teams (p. 30). Teams have been suggested as ways to increase productivity, reduce costs, and improve customer relationships. Change agents have been called upon to design six sigma, reengineering, TQM, CQI, and strategic partnership teams. Yet, with the use of such teams often comes conflict. We assume that employees know how to work together when, in fact, they do not. Most employees on teams lack the basic tools to manage conflict. So the question for such organizations becomes, how can we best provide our employees who are working in teams with appropriate conflict management facilitation and training?

## Statement of the Problem

There are countless studies that present evidence to support the need for training to resolve conflict in SDWTs. Friedman, Todd, Curra ll, and Tsai (2000) concluded that training should use an integrative style. Donovan (1996) suggested a 3step team building training process before empowering teams with managerial responsibilities. Moravec (1999) recommended that training be structured to deal with employee resistance to teams and change.

The problems, however, still persist: what type of training methods is best to use? How do we translate research into effective training interventions? Carroll (1998) believed that most of what has been written about teams has focused on introducing the reader to concepts and the rationale for teams. Further, he stated that these accounts meet the needs of people who are at the conceptual, exploratory stage but are not much help to individuals who need a how-to model (p.21).

With the growing popularity of teams, there has also been an explosion of commercial training programs. However, workshops tend to be somewhat vague about the psychological processes underlying teams (Magney, 1996, p. 565). Tsang (1997) made a similar observation on prescriptive books about team building and conflict management. Further, Joinson (1999) cited informal and anecdotal evidence that the failure rate of SDWTs due to various forms of unresolved conflict is 50% (p. 3). HRD professionals are under enormous pressure to design training interventions and to create change more efficiently the first time. Therefore, knowing what type of training method to use would be beneficial to the HRD profession.

This paper, then, will explore the effects of two types of training methods that were given to two start-up teams during their initial phase of development. Following are a brief review of the literature on conflict management (CM) and cooperative learning (CL); a description of the study's context and methods used (observations, interviews, and surveys); and conclusions about the efficacy of both approaches. No other case study has been identified that attempts to examine the effects of implementation of CL as a conflict management approach that is observed and studied in the context of one of two groups.

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## Literature Review

This literature review examines conflict management (CM) research, including both the traditional lecture and cooperative learning (CL) training methods.

### *Conflict Management*

At the organization level, Meyer (1999) suggested that it is management's responsibility to know the appropriate application for teams. If there is a lack of clarity in this organizational vision, conflict can arise in teams. Seaman (1995) argued that the major source of team conflict is management's strategic misalignment of teams. Seaman saw strategy as driving the development of all other elements, such as values, structure, culture, and information systems. All of these elements must line up to avoid conflict. Team leaders can also be a source of conflict. At this level, conflict may arise from issues of traditional command and control (Carroll, 1998) and management resistance to teams (Carroll, 1999; Seaman, 1995; Yeatts, Hyten, & Barnes, 1996). Yeatts et al. (1996) and Dreachslin, Hunt, and Sprainer (1999) cited research that suggested that the best teams are those of equal rank. Seaman (1995) argued that conflict arises from the lack of team autonomy.

The traditional lecture method or some variation of it is the preferred method for companies who train in conflict management. Kreitner and Kinicki (1998) found that Deloitte Touche sends both employees and teams to retreats to engage in relationship building. Team members are trained in CM by facilitators who help the groups interpret the meaning of the individual and team traits in order to build future relations. Carroll (1999) found in one organization that its traditional command and control structure of supervisors was the problem. Therefore, CM consisted of training to eliminate the company's old structure and to build interdependence. Liebowitz and Holden (1995) detailed how the Corning Corporation and Motorola use the traditional method to train its teams on participatory style.

### *Cooperative Learning*

Cooperative learning (CL) is nothing new in the field of education. Educational psychologists have been recommending this technique for teachers in secondary and primary education for years. Recently, scholars have begun to look at its potential for preparing business students for the corporate world. The theory of CL was defined by Deutsch (1949) and further developed by Johnson and Johnson (1998), Slavin (1985), and Kohn (1992). While the literature is rich on CL, no references were found on the use of the actual implementation of CL for conflict management purposes within a corporate setting.

Carroll (1999) noted that task sharing among teams increased productivity. Seaman (1995) suggested that employees who interfaced on teams competitively instead of collaboratively produced negative outcomes. Dreachslin et al. (1999) found that defined roles in teams produced positive perceptions among team members. Kirkman, Jones, and Shapiro (2000) indicated that, if employees are more individualistic than collectivist, they will resist teams, producing lower levels of team effectiveness. Liden, Wayne, and Bradway (1997) and Pearce and Gergersen (1991) found that the relationship between group control over decision-making and group performance became more positive with increased levels of task interdependence. Thus, group control over decisions may result in higher performance.

While the previous studies implicitly touched on certain aspects of CL, Alper, Tjosvold, and Law (1998) explicitly cited the work of Deutsch (1949) and Johnson, Johnson, and Holubec (1998). They found that, when blue-collar employees created cooperative goals, their teams gained confidence and improved work productivity. Janz (1998) applied CL theory to a group of IT professionals, using cooperation, positive interdependence, face-to-face interaction, social skills, and group processing. Janz found that the autonomy inherent in SDWT might lead to increased levels of satisfaction, motivation, and performance. The level of CL that takes place on a team may be important in achieving improved work outcomes, according to Presutti, Williams, and Buzzi (1995) and Lindquist and Abraham (1996), who implemented CL in business classrooms.

## Corporate Setting

Before the field research was conducted, the senior author served as the Director of Strategic Planning and Human Resources for the company involved. This surface-to-air emergency medical service (EMS) unit is headquartered in the upper Midwest, is a little more than 30 years old and has approximately 1,250 employees. It has a reputation that is second to none within its industry and is owned by a competing yet cooperative consortium of hospitals. The



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company competes freely within and outside of its home state. Although the rotor wing division produces the highest volume of revenue per mission, it is the ground division that produces the highest revenue, while the fixed wing division currently operates at a loss.

The management team and the staff have a culture of close interactions and relationships, which at certain times draws the administrative process into chaos. This is perhaps due to the company's beginning as a sole proprietorship, in which every employee had to rely on each other, with a minimum of infrastructures and protocols. Employees often bypass line management to discuss issues of concern with the CEO.

The organization's position has fluctuated within the industry, partly because of economic cycles, and partly because of withdrawal of consortium subsidization, which had made the group complacent. The firm managed to stay afloat by quickly implementing cost reduction measures, such as outsourcing certain divisions, restructuring and reengineering other departments, and layoffs. In addition, the company closed several key bases that gave them market presence in rural areas.

Politically and economically, factors in health care demanded that companies do their work faster, more efficiently, and at less cost, while still maneuvering through truckloads of red tape for third party reimbursements. However, the oligopoly in which the firm competes makes increasing market share difficult. The firm is one of three leaders in its regional industry, and each has recognized that price cuts would trigger full-scale corporate warfare that none of the three wants. Finally, upgrading computer software during the impending Y2K issue had every EMS firm in the industry worried about costs.

Conflict occurred between the old ways of doing things and new approaches. Management believed that, in order to answer changing industry trends, changes must be made. The employees believed that the old ways were what established the firm's superior reputation. To some extent, both were correct. This company was no longer in its infancy; it was no longer a startup family business. It was now a mature company in a mature industry, seeking to find ways to survive, by, as the CEO remarked, "confronting our paradigms and culture."

The management team decided that one approach to developing a competitive advantage was to develop core skills to market billing services, which required developing the Billing Center. The Director of Operations suggested benchmarking competitors, while the Director of Finance argued that this would tip the firm's position and might allow competitors who were in a better position to service customers a head start. The CEO and the Director of Strategic Planning and Human Resources suggested that the process begin by forming a team that would assess the current processes and perform business process mapping of the current billing situation. Two objectives were assigned to the senior author, both of which would require team building: integrate and build infrastructures of the strategic business unit (SBU) (a recent merger with a small, rural company), and develop and market billing services by 2000.

*Billing Team.* The creation of a Billing Center was to expand into untested markets in billing and claims services by expanding reach and becoming more competitive within the health care industry, which was suffering because of the maturity of that market. They hoped to capitalize on targeting smaller firms that were facing near extinction due to additional government restrictions and compliance issues, as well as the impending Y2K issues.

Following intensive analysis, however, the project team found that the company's performance measures were considerably worse than those of competing organizations. The project team determined that these problems arose from outdated computer systems, duplication of processes, and incomplete data gathering by the clinical staff after transports. The Billing Team was given the responsibility of designing a new policies and procedures manual based on changes in the billing process. New job descriptions were also to be developed.

Within days of the final project meeting, the Billing Team started having problems with their assigned objectives. Members of the team expressed their concerns one by one to the CEO, lodging complaints against each other, about the lack of appropriate meeting procedures, and the massive assignment that lay before them. The Director of Strategic Planning and Human Resources was asked by the CEO to observe a team meeting and interview the members. Many arrived late for the meeting and were horrified that someone from management was there and had caught them late. Then, some who were late got upset with their counterparts for not warning them that the Director of Strategic Planning and Human Resources would be there.

There were no team rules; those who had the floor never got a chance to complete their point. There was mistrust in the air, with apparent factions that enforced their will by overruling other points of view. The agenda had 8 items listed, but only two were completed in the two-hour meeting. The day of the interviews, two of the six members called in sick. The other four told me of his or her distrust of management. "Management didn't take note of these concerns for years. These problems with billing didn't just happen over night." They also expressed their distrust of each other in ways one could not believe. A third theme was a lack of training and control. Finally, the employees had serious charges about the hostile work environment created by the former Director of Finance.



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The situation had reached a boiling point. This group was a long way from becoming a cost center, let alone processing the company's claims. The CEO and the Director of Strategic Planning and Human Resources agreed that a skilled consultant was needed to assess the situation. The second author was hired for this purpose. In addition to several technical items, the consultant recommended training in team processes and conflict management. He also recommended that the teams be set up as cross functional. Therefore, for the purposes of conflict management training, the teams would be made up of all six billing employees, one from the clinical ranks, and two from the communication center. Another consultant was retained to offer a five-day conflict management seminar, using a traditional lecture approach.

*Strategic Business Unit Team.* The strategic business unit (SBU) is located in a neighboring state within a small rural town. The same initiatives that went into creating a revenue generating cost center were behind the decision to form a joint partnership. However, the objectives were quite different. The firm was looking to expand its reach and presence within the market. This partnership was the company's second attempt at expansion. Numerous problems started developing. The firm failed to account for how both companies' employees would react to each other. The rural employees resented the fact that most of the firm's employees did not consider them to have expertise and felt shut out during patient assessment. In truth, they did not have the high caliber of training that the company's employees were expected to have. Further, the rural employees also did not like the fact that most hospitals now referred to them as the company's name instead of their original name. They felt that having two types of supervisors and two different uniforms were confusing to the hospitals. Finally, the rural partner's employees were fiercely loyal to their base supervisor, and they believed that the firm's RN's were superceding their authority. The company employees were also loyal to the firm and its uniforms. They believed that respect must be earned, not just given away to employees who had no training or no critical care expertise. The Director of Strategic Planning and Human Resources was assigned solve the problems. Cooperative learning was the intervention selected.

**Methods**

The research was based on Tjosvold and Morishima (1999), Liden et al. (1983), Barker et al. (1997), Alper et al. (1999), and Janz (1998). The instructional methods used are provided below.

Following the training, both groups were surveyed using a survey similar to the earlier researchers. Second, the Linquist and Abraham (1996) White Peak survey instrument was selected because the authors actually implemented the jigsaw II CL method to college students, which is the closest survey instrument to our research intent. The company's management team reviewed the survey as well as administered it to another SDWT. The survey instrument was then modified to increase its reliability and validity. Because of the senior author's relationship to one of the sites, both surveys were administered and scored by Human Resources Assistants to increase controls. The first survey instrument assessed all dependent measures (employee attitudes, perceptions of self-esteem, interpersonal skills building, and perceived achievements) at the end of the training. The survey was comprised of 13 statements to which participants responded "strongly agree," "agree," "undecided," "disagree," or "strongly disagree," with "strongly agree" =1.

The second survey was administered three months after training. It was slightly modified to include CL terms. The inclusion of the CL terms was an attempt to examine differences between a team taught by the actual CL method and a team not trained in CL but which was given the CL terms, consistent with prior research. In addition, observations were made three months after training. The managing stakeholders of the process were also interviewed three months after the interventions to address productivity through the eyes of management. Productivity was also assessed through the group's timetables to completion of key initiatives.

*Conflict Management Lecture Method*

The traditional lecture method can best be defined as Instructional Objectives Learning (IOL). There are three components to IOL: performance, in which an objective always says what a learner is expected to be able to do; condition, in which an objective always describes the important conditions (if any) under which the performance is to occur; and criteria, where an objective describes the criteria of acceptable performance. The traditional conflict management lecture approach was used with the billing team. The consultant selected had solid experience in HRD, as well as an extensive theoretical background with a Ph.D. in HRD. There were three meetings between the consultant and the Director of Strategic Planning and Human Resources. Of the seven objectives that the group developed, the consultant focused on improving teamwork.



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The first meeting covered and incorporated issues in the literature review, such as team failure, barriers to team success, and CM strategies. The second meeting addressed the current conflicts resulting from the assessments. We agreed that the best approach for the consultant to take was to focus on relationship improvements. The rationale was that, if relationship conflict could be resolved, task conflict could be managed and the team goals implemented. During the third meeting, the consultant presented her proposal, which was accepted after several revisions were made.

The seminar was designed for three sessions in which the consultant instructed using an instructional objectives learning approach. The Director of Strategic Planning and Human Resources added a fourth session, which lasted about 2 hours, to go over terms and definitions of CL without facilitating a CL lesson structure. This was done to prepare the team for the final survey on CL terms.

*Cooperative Learning Methods*

CL is a technique that requires students to work together in small, fixed groups on a structured learning task. In the literature CL was found to enhance student attitudes, perceptions of interpersonal skill building, and self-esteem. Common to all CL structures are four key components. First, positive interdependence must exist whereby students perceive that they must "sink or swim" together. This is achieved through goal, task, and role interdependence (Slavin, 1985). Second, face-to-face interaction among teammates must take place involving verbal interchanges. This allows students to talk aloud, challenge one another's points of view, and focus on the problem-solving process rather than the answer. Third, individual accountability must exist, requiring that every group member be accountable to learn all required material. Finally, interpersonal and small-group skills must be built into the CL structure. One such skill is group processing, whereby students analyze their own and their teammates' performance in the group. All of these components were built into the training.

The facilitator of the CL approach with the SBU was the Director of Strategic Planning and Human Resources, who has extensive experience in the traditional lecture methods and has an M.Ed. in HRD. The SBU consisted of thirty employees, fifteen of whom were selected by their peers to go to training, ten females and five males, eight nurses and seven technicians. The conflict management training for the SBU was longer than for the Billing Team because time was needed to train the SBU employees on strategic planning and continuous quality improvement. CL is different from the traditional lecture method in that the facilitator can structure a lesson (training) plan while developing the group's social skills (team building). Discussions with the co-partners resulted in an approved training agenda that included the barriers to teams, team failures, and CM strategies.

**Results**

Results are presented, in order, of the surveys, the observations, the management interviews, and the progress being made by the teams on their timelines for accomplishing their objectives.

*Surveys*

The surveys measured participants' perceptions of their attitudes, self in relation to teams, interpersonal factors, and training contributing to achievement, while the second survey added one question on accomplishments and four questions on CL. All nine members of the Billing Team responded, as did all 15 of the SBU team. See Table 1 for the results immediately after training and Table 2 for the results three months after the training.

Both groups were optimistic about their abilities to handle conflict and accomplish their goals immediately after the training. However, after three months, the SBU team was more optimistic, while there was considerable deterioration in the perceptions of the Billing Team. Although the Billing Team optimism had deteriorated, they still perceived that their goals were interdependent. However, they did not believe they were working together. The SBU also believed that their goals were interrelated, but they perceived that the team was working together to complete them. Of course, there is no way to know whether these differences occurred because of the training approach, the support offered to the teams by management, the personalities involved on the teams, or some other cause.

*Observations*

Observations made three months after the training revealed that the Billing Team relied heavily on the team champion who was the former supervisor of the dispatch team. She set the direction and accountabilities and

resolved sticking points, just as she had in her prior role, which had been eliminated. She agreed to allow observation at the next meeting without her presence. The group had problems deciding how to choose a facilitator,

Table 1. *Survey Results Immediately After Training*

| Question | Billing Team Mean | sd | SBU Mean | sd |
|---|---|---|---|---|
| **Attitude:** | | | | |
| Other team members | 1.33 | .71 | 1.26 | .46 |
| Handle conflict outside team | 1.33 | .50 | 2.33 | .51 |
| Delegate work to accomplish goals | 1.56 | .82 | 1.20 | .38 |
| How team members feel | 1.56 | .82 | 1.06 | .38 |
| Conflict management training was needed | 1.11 | .33 | 1.11 | .35 |
| **Self Assessment:** | | | | |
| Own ability to resolve conflict | 1.11 | .33 | 1.26 | .46 |
| More part of the team | 1.33 | .71 | 1.06 | .38 |
| **Interpersonal:** | | | | |
| Able to build better relationships | 1.11 | .42 | 1.26 | .46 |
| Prefer to work as a team | 1.33 | .71 | 1.06 | .38 |
| Better understand team member duties | 1.33 | .50 | 2.33 | .51 |
| **Training Contributing to Achievement:** | | | | |
| Usefulness of role playing | 1.11 | .33 | 2.33 | .51 |
| Usefulness of listening and responding exercises | 1.22 | .44 | 1.26 | .46 |
| Usefulness of interactive skills practice | 1.00 | .00 | 1.20 | .38 |

(1 = Strongly Agree)

Table 2. *Survey Results Three Months After Training*

| Question | Billing Team Mean | sd | SBU Mean | sd |
|---|---|---|---|---|
| **Attitude:** | | | | |
| Other team members | 2.00 | 1.08 | 1.60 | .51 |
| Handle conflict outside team | 1.22 | .71 | 1.33 | .97 |
| Delegate work to accomplish goals | 2.56 | 1.92 | 1.13 | .35 |
| How team members feel | 3.56 | 1.92 | 1.27 | .46 |
| Conflict management training was needed | 3.44 | 2.02 | 1.11 | .35 |
| **Self Assessment:** | | | | |
| Own ability to resolve conflict | 3.78 | 1.22 | 1.33 | .97 |
| More part of the team | 2.77 | 1.95 | 1.40 | .51 |
| **Interpersonal:** | | | | |
| Able to build better relationships | 3.00 | 1.82 | 1.45 | .51 |
| Prefer to work as a team | 2.67 | 1.72 | 1.20 | .41 |
| Better understand team member duties | 2.67 | .77 | 1.27 | .46 |
| **Training Contributing to Achievement:** | | | | |
| Usefulness of role playing | 2.67 | 1.41 | 1.27 | .46 |
| Usefulness of listening and responding exercises | 2.67 | 1.41 | 1.27 | .46 |
| Usefulness of interactive skills practice | 2.67 | .77 | 1.28 | .46 |
| Meeting our goals | 3.00 | 1.82 | 1.0 | .00 |
| **Cooperative Learning** | | | | |
| We are working together | 3.00 | 2.04 | 1.20 | .41 |
| My goals interrelated to team goals | 2.33 | 1.91 | 1.20 | .41 |
| For me to succeed, team must meet its goals | 1.22 | .71 | 1.20 | .41 |
| Team supporting each member | 4.11 | 2.33 | 1.27 | .46 |

(1 = Strongly Agree)

which caused tension among the members. During the discussion, alliances became clear, with two informal leaders emerging, with each having an equal number of followers. This is consistent with team comments made after training where one team member stated, "The trainer was outstanding but how will we pick who will lead the team?" It appears that the group did not choose formally, so informal combatant roles developed. Another team comment was, "The training helped us get a start on how to relate to each other, but what will we do about assigning the many tasks that are ahead of us?" Responsibilities assigned were consistent with those laid out by the team champion . No other objectives were completed subsequent to her starting to lead the team. No one was held accountable. The only assignments that had been completed were those done by the team's cross-functional members. The remaining objectives were the billing employees' sole responsibilities. This meant that the team's timetable for completion was at least 5 to 6 months behind.

The observations of the SBU team were delayed an additional two months. As the group was assembling, they were deciding who would be the recorder, who would sum up each point, and so on. One person said, "I was gatekeeper last time, so that makes me the facilitator." The team members were all wearing the same uniforms, in response to their goal of providing consistent care. The meeting started with a sub-committee report with members from both groups of employees. The gatekeeper cautioned them about how much time was left. Various committees spoke on objectives that had emerged since the training. One committee report presented two opposing solutions to a problem. This was done with consideration, and the other members of the committee paid close attention to both perspectives and asked questions. This team was ahead of schedule and had exceeded expectations.

*Management Interviews*

The interview regarding the Billing Team revealed that the goals and the team's timetable were not done, even though it was two months past the target completion date. Only 30% of the objectives had been accomplished, and that portion was credited to the team leader who had facilitated the effort. The Director was shocked to hear that the other objectives had not even been begun. The team champion commented, "they (the team) seem to have gravitated back to the way they were." The senior manager involved acknowledged that he had let the team down by not staying on top of the situation. His team champion had not kept him abreast of the unfolding events on the team.

A conference call was arranged with the Director of Marketing and the co-partner at the SBU site. Customer complaints had fallen by 55% in the last six months, and sales were up by 5%; internal complaints about each other had stopped completely. The only negative comment was that "there still was a lack of management communication by both co-partners. The team was nearing 73% of completion of its objectives, and management was keeping them from completing more."

**Conclusions**

There are many limitations to this research case study. First, the two groups had different facilitators with different backgrounds and styles. Second, one author was the facilitator for the CL intervention. Third, the Billing Team had a long history of conflictive interaction, which is much more difficult to turn around than when the focus is on a team that has no previous experience of working together. The objectives for the two teams were also different, and the location (corporate headquarters in the city and the SBU site was in a rural setting in another state) also created some problems for the research.

Nevertheless, it is clear that the training itself was effective in both settings, based on the observations and the participants' perceptions as reflected in the surveys. The Billing Team perceived that they had moved to another level. The team was energized, upbeat, and open to possibilities of continuous change, and to that extent the traditional method worked well. The problem was that management failed to provide the time, resources, and support needed for the objectives to be met. As a result, the team gravitated back to their original level. Finally, while the Billing Team believed their goals were interrelated their productivity, as judged by management was below standards, a result inconsistent with prior research.

CL is promising as an application in the business environment. CL methods were also extremely cost effective, as it took twelve meetings to facilitate a strategy for the billing department plus another four days for conflict management training. The CL tool was able to do both in four days.

There is clearly a need for much more research on this topic. It would be appropriate, perhaps in a larger corporate setting, to carry out a similar study, but to follow experimental methodology. CL has been around for a long time in education and has proven to be effective in a business context.

**Implications for HRD Practice**

HRD is always seeking cost effective approaches. CL may be a way for organizations to deal with the need for conflict management, while at the same time accomplishing some other strategic initiative, thus killing two birds with one stone. CL appeared to have a consistent way of having teams remember their roles and leadership procedures during meetings, whereas the team trained under the traditional lecture method appeared not to use their CM training. This study is of importance because there is no identified attempt to implement CL training for purposes of conflict management in a corporate environment.

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# A Force-Field Analysis of Factors Affecting Men and Women Choosing to Become Professional Pilots

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*This study investigated the use of force-field analysis to identify factors that could influence people to enter fields where there are critical shortages. The procedure was applied to factors that might positively or negatively influence men and women choosing to become professional pilots. Twenty factors were identified as having significantly different importance to the recruitment of both men and women. Implications for the design of recruitment efforts for both men and women are significant.*

Keywords: Recruitment, Professional Pilots, Force-field Analysis

Recruitment of personnel into positions where there is a serious shortage is a problem that affects many fields. This study investigated the use of force-field analysis to identify positive factors that could be emphasized during recruitment and negative factors that might be minimized to remove barriers to recruitment.

The procedure was applied to the recruitment of professional pilots. The air transportation industry is currently experiencing a shortage of qualified professional pilots. This shortage is affecting all levels of the industry. Flight schools, charter operators, corporations, and regional and major airlines are all having difficulty finding and retaining professional pilots.

The shortage is attributed to a combination of rapid growth in the air transportation industry and the increasing number of airline pilots (mainly Vietnam era military trained pilots) reaching mandatory retirement age. Activity in the air transportation industry is expanding at rates of five to ten percent a year. At the same time pilots are expected to retire at rates from ten to twenty percent a year during the next decade (Hedden, 2000; Mark, 1999).

Although there is a need for more men and women to become interested in becoming pilots, the small numbers of women pilots suggests that women may be a particularly untapped source. They represent only 3.75% of all Federal Aviation Administration (FAA) certified professional pilots in the United States (AOPA, 2000). In addition, over the past ten years that number only increased by about one percent (FAA, 2000).

Many factors have been barriers to women becoming professional pilots. One major factor has been the military as the primary source of professional pilots. Until recently women were not trained as military pilots. Another has been the historical negative sentiment toward women becoming professional pilots (Thornberg, 2000; Turney, 2000; Turney, 1995).

## Problem

Increasing the number of men and women pilots to meet future needs will require recruitment efforts based on an understanding of factors affecting the choice to be a professional pilot. It will be important to not only understand factors that might positively influence choice but also factors that might negatively influence it. Such information can be helpful to human resources departments, educators, and industry leaders in emphasizing the positive factors and trying to take action to remove the negative factors.

This report presents a study that investigated the factors that might positively or negatively influence men and women choosing to become professional pilots. In addition, it investigated whether the factors differ for women and men.

## Career Choice Literature

There is a large body of research on general career choice, career development, and non-traditional career choice. Although this research does not specifically include aviation career choice, it does offer insight into factors that might influence career choice and recruitment in general. Past research suggests many recurring themes that

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influence career choice among men and women such as: their tendencies to pick traditional work roles, family influences, societal influences, peer pressure (Freeman, 1997; Bee, 1996; Lankard, 1995; Gunn, 1994), the importance of role models and mentors (Kerka, 1998; Jewett, 1996; Kelly, 1993), the influence of teachers and guidance counselors, the impact of early experiences (Furlong & Biggart, 1999; Stitt-Gohdes, 1997; Lent, Hackett, & Brown, 1996), and the differing views of men and women about what is important in a career (Gati, Osipow, & Givon, 1995).

**Method**

The study was conducted using a methodology called force-field analysis (Harrison, Shirom, 1999; Lewin, 1951). It is based on the premise that there are both positive and negative factors that influence individual decision-making. The extent to which each factor influences a person's decision is based on how important it is to the individual. This level of importance is called factor strength. If the sum of the strengths of the positive factors influencing a choice outweigh the sum of the strengths of the negative factors, it is believed that a person will make a positive choice. The reverse is also true.

The first phase of implementing this methodology is to identify the range of factors that might have positive or negative influences on a decision. The second phase is to ask those knowledgeable about the particular decision to rate each factor according to its strength as a positive or negative factor (Harrison, Shirom, 1999; Rothwell, Sullivan, McLean, 1995).

This study implemented the force-field methodology in three stages. First, factors that might affect a person's decision to become a professional pilot were identified. This was done by developing an initial list based on a review of the literature, and two brainstorming sessions with seven female and 13 male volunteer university bachelor's degree aviation majors. The list was then sent to a selected group of 15 female and 15 male aviation experts identified by the staff of St. Cloud University's aviation program. They were asked to add additional factors that might be missing. During this first stage the goal was to identify as large a list of brainstormed factors as possible. All factors suggested were added to the list. Editing was done only to remove duplicate items. Seventy factors were identified.

The second stage was to send the list of factors in the form of a rating scale survey instrument to a sample of professional pilots to determine which factors influenced their choices. It was not possible to identify people who might have considered becoming a pilot and did not. Therefore, an assumption was made that by studying women and men who were already professional pilots, inferences could be made about individuals who did not choose to become pilots.

The population of professional pilots within the United States was identified through a commercially sold CD containing the 1998 FAA database of pilots' names and addresses (Avantext, Inc.) Random samples of 300 female and 300 male pilots were drawn. The first 250 within each sample were considered to be the primary sample. The 50 additional people in each sample were designated as random alternates to replace people whose surveys were never delivered due to an inaccurate address.

The survey instrument had two parts. The first gathered demographic data from the subjects on three variables: gender, number of years as a professional pilot, and type of pilot. The three types of professional pilots were airline, corporate/charter, and "other" pilots. The second part contained a rating scale designed to allow subjects to rate the extent to which they felt each of the 70 factors identified during brainstorming influenced their decision to become a pilot. Subjects rated each factor using the following scale.

| -3 | -2 | -1 | 0 | +1 | +2 | +3 |
|---|---|---|---|---|---|---|
| strong negative influence | | | no influence | | | strong positive influence |

Positive ratings indicated a factor had a positive influence and negative ratings indicated it had a negative influence. A rating of zero indicated it had no influence. It was decided that a zero rating would be defined as a rating between -.5 and +.5 because less than .5 would be rounded to zero. Therefore, in order for a rating to be considered it would have to be less than -.5 or to be positive it would have to larger than +.5.

**Data Gathering**

Once the instrument was developed it was sent with a cover letter explaining the study to all 300 male and 300 female pilots. In addition two follow-up mailings were sent to those who did not respond. During the three mailings

52 male and 56 female survey instruments were returned incomplete because of bad addresses. Since two more inaccurate addresses were found for and 6 more were found for females the effective sample was 248 males and 244 females. This resulted in an overall response rate was 68% (333/492). The response rate from the males was 66% (163/248) and the response rate from the females was 70% (170/244).

**Results**

*Demographic Data*

The demographic variables of type of pilot and years as a professional pilot were analyzed to determine if there were significant differences between males and females. The data are presented in Tables 1 and 2. Results of chi-square analyses revealed that there was no significant difference in the distributions of types of pilots between males and females ($X^2$ = 1.853, p = .396). The largest number of pilots were airline pilot and the smallest number were corporate. However, there was a significant difference in the length of time the males and females had been pilots ($X^2$ = 36.732, p < .000). The males tended to have been pilots for a longer period of time than females.

Table 1. *Types of Professional Pilots for Males and Females*

| | Type of Pilot | | | |
|---|---|---|---|---|
| | Airline | Corporate | Other | Total |
| Male | 76 | 35 | 66 | 163 |
| Female | 69 | 35 | 52 | 170 |
| Total | 145 | 70 | 118 | 333 |

$X^2$ = 1.853, p = .396

Table 2. *Amount of Time as a Professional Pilot for Males and Females*

| | Years as a Professional Pilot | | | |
|---|---|---|---|---|
| | 0-10 Years | 11-20 Years | 21+ Years | Total |
| Male | 25 | 57 | 81 | 163 |
| Female | 64 | 71 | 35 | 170 |
| Total | 89 | 128 | 116 | 333 |

$X^2$ = 36.732, p = .000

*Positive and Negative Influences*

The factors that positively and negatively influenced choices to become professional pilots were analyzed by first calculating the mean ratings to each factor for males and females. Positive means meant the factors had a positive influence and negative means meant they had a negative influence. The factors were then placed in rank-order according to the means separately for the females and males. The rank-orders assigned by males and by females were compared using a rank-order correlation. The rank order correlation indicated that the ordering of the factors by both men and women was very similar (r=.77, p < .05). Because of this overall similarity the ratings of the men and women were combined and overall mean ratings were placed in rank order to represent the ratings of the total group as presented in Table 3.

Sixty of the 70 factors were found to have a positive influence on career choice and 10 were found to have a negative influence. After applying the decision rule that mean ratings between -.5 and +.5 would be treated as zero ratings, 33 factors were identified as positive and only one was negative. Those that fell between -.5 and +.5 are indicated in Table 3 in italics. Cost of required training/education was the only negative factor remaining.

A review of the positive factors suggests that they can be categorized into the following themes: enjoyment of aviation, support of peers and flight instructors, perception of career and education requirements, desire for challenge and responsibility, early exposure to aviation, science, and technology, perception of potential income and lifestyle.

*Differences Between Male and Females.* Although the relative ordering of the factors by males and females were similar as indicated by the rank order correlation, differences the actual magnitude of the influence of the factors for females and males were examined for each of the factors separately. It was possible that although males and females would view the various factors similarly in terms of there rank order of influence, the actual amount or strength of influence of the factors for males and females could be different.

Table 3 . *Rank Order of Career Choice Influence Factors for All Respondents*

| Rank | Influence Factors | Mean |
|---|---|---|
| 1 | Love of Flying | 2.5700 |
| 2 | Interest in Aviation | 2.5300 |
| 3 | Desire for Challenging Career | 2.1400 |
| 4 | Perceived as a Fun Profession | 1.8700 |
| 5 | Perceived as an Adventurous Profession | 1.7200 |
| 6 | Desire to Prove Personal Abilities | 1.7000 |
| 7 | Desire for Career with a High Level of Responsibility | 1.6800 |
| 8 | Desire to Travel | 1.5200 |
| 9 | Perception of Achievable Lifestyle | 1.4300 |
| 10 | Perceived Prestige of Being a Professional Pilot | 1.4000 |
| 11 | Perceived Travel Benefits | 1.3700 |
| 12 | Perceived Career Advancement Possibilities | 1.3300 |
| 13 | Perceived Technical Nature of Profession | 1.3200 |
| 14 | Support and Encouragement of Flight Instructor(s) | 1.2600 |
| 15 | Early Exposure to Aviation | 1.2500 |
| 16 | Perceived Innate Ability | 1.1900 |
| 17 | Desire to Pursue Non-Traditional Work Role | 1.0600 |
| 18 | Perceived Potential Income | 1.0400 |
| 19 | Desire for a Technical Profession | 1.0300 |
| 20 | Exposure to Science/Technology at Young Age | 1.0000 |
| 21 | Perceived as a Glamorous Profession | 0.9900 |
| 22 | Perceived Knowledge Requirement | 0.9700 |
| 23 | Parental Support | 0.9000 |
| 24 | Desire to Serve Others | 0.7900 |
| 25 | Training Methods Used | 0.7700 |
| 26 | Knowledge of Professional Pilot Career Options | 0.7500 |
| 27 | Peer Support | 0.7000 |
| 28 | Availability of Math/Science Courses in High School | 0.6400 |
| 29.5 | Perceived Training Requirements | 0.5600 |
| 29.5 | Exposure to Aviation Mystique | 0.5600 |
| 31 | Same Gender Role Model(s) | 0.5400 |
| 32 | Military Career Potential | 0.5300 |
| 33 | Desire for Authority | 0.5200 |
| *34.5* | *Same Gender Mentor* | *0.4600* |
| *34.5* | *Perceived Societal Support* | *0.4600* |
| *36* | *Exposure to Non-Traditional Gender Roles at Young Age* | *0.4400* |
| *37* | *Family Member (other than parent) was/is a Pilot* | *0.4200* |
| *38* | *Opposite Gender Mentor* | *0.4000* |
| *39* | *Encouragement to take Math/Science/Technical Classes in High School* | *0.3800* |
| *40* | *Opposite Gender Role Model(s)* | *0.3500* |
| *41* | *Required High School Math and Science courses* | *0.3400* |
| *42* | *Parent was/is a Pilot* | *0.3200* |
| *43.5* | *Family Influence to Become a Pilot* | *0.2900* |



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Table 3 (continued) . *Rank Order of Career Choice Influence Factors for All Respondents*

| Rank | Influence Factors | Mean |
|---|---|---|
| *43.5* | *Early Retirement Options* | *0.2900* |
| *45* | *Parental Expectations for Career* | *0.2400* |
| *46* | *Proximity to an Aviation School* | *0.2300* |
| *47* | *Perception of Same Gender Pilots by Peers* | *0.1800* |
| *48* | *Expectations of Math/Science Teacher(s)* | *0.1700* |
| *49* | *Perceived Family Life Impact* | *0.1400* |
| *50* | *Knowledge of Equal Employment Opportunity Rules and Current Hiring Trends* | *0.1300* |
| *51* | *Perceived as a Dangerous Profession* | *0.1200* |
| *52.5* | *Opposite Gender Flight Instructors* | *0.1100* |
| *52.5* | *Amount of Time Required to Become a Professional Pilot* | *0.1100* |
| *54* | *Availability of Same Gender Flight Instructors* | *0.0721* |
| *55* | *Perceived Medical Requirements* | *0.0661* |
| *56* | *Amount of Training/Education Required* | *0.0631* |
| *57* | *Parent was/is a Professional Pilot* | *0.0541* |
| *58* | *Historical Hiring Patterns* | *0.0480* |
| *59* | *Same Gender Math/Science Teacher(s)* | *0.0360* |
| *60* | *Desire to Pursue Traditional Work Role* | *0.0150* |
| *61* | *Gender Role Stereotyping* | *-0.0270* |
| *62* | *Participation in Youth Aviation Program(s)* | *-0.0390* |
| *63* | *Perceived Male Domination of Profession* | *-0.0511* |
| *64* | *Peer Pressure to Choose Traditional Work Role* | *-0.0570* |
| *65* | *Perception of Failure Rate* | *-0.0721* |
| *66* | *Societal Pressure to Choose Traditional Work Role* | *-0.0781* |
| *67.5* | *Family Pressure to Choose Traditional Work Role* | *-0.1100* |
| *67.5* | *Support of High School Guidance Counselor(s)* | *-0.1100* |
| *69* | *Availability of High School Aviation Course(s)* | *-0.1700* |
| 70 | Cost of Required Training/Education | -0.7400 |

T-tests analyses were conducted on those factors for which either the males or females had average ratings of less than -.5 or more than +.5. Those analyzes indicated there were significant differences between the male and female ratings at the .05 level on 20 factors even though both groups felt the 20 factors were positive. The analyses are presented in Table 4. The differences were calculated by subtracting the male mean from the female mean to show the direction of the difference in reference to the female responses.

Table 5 presents a summary of the factors that have a more positive influence on men and women becoming pilots and those that seem to affect both groups equally. Men appear to be influenced most by monetary reward, the technical and scientific nature of the occupation, the military career potential, and the glamour and mystique of flying. Also, men found having same gender teachers and mentors more important than women. Women found factors such as exposure to and desire to choose a non- traditional work role, opposite gender mentors and role models, desire for a challenging career and to prove their personal abilities as more positive factors than men. They also saw possibilities of travel and flight instructor encouragement as more important factors. Although both groups saw cost of training as a negative influence, men were less influenced by the cost of training than women.

**Discussion and Implications**

This study demonstrated that force-field analysis is a viable technique for identifying factors that could affect the recruitment of people into various occupations. When applied to the role of professional pilot it was able to



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Table 4 . *Factor Differences Between Male and Female Respondents*

| Influence Factor | Male Mean | Female Mean | Diff. in Means | T-Value (P-value) |
|---|---|---|---|---|
| Perceived Potential Income | 1.1800 | 0.9100 | -.27 | 2.132 (.034) |
| Required High School Math and Science Courses | 0.5000 | 0.1800 | -.32 | 2.984 (.003) |
| Perceived as a Glamorous Profession | 1.2100 | 0.7800 | -.43 | 3.641 (.000) |
| Desire to Pursue Non-Traditional Work Role | 0.7200 | 1.3900 | .67 | -5.040 (.000) |
| Perceived Technical Nature of Profession | 1.5000 | 1.1500 | -.35 | 2.925 (.004) |
| Exposure to Science/ Technology at Young Age | 1.2000 | 0.8100 | -.39 | 3.023 (.003) |
| Opposite Gender Role Model(s) | 0.0000 | 0.6900 | .69 | -6.695 (.000) |
| Same Gender Mentor | 0.6200 | 0.3100 | -.31 | 2.758 (.006) |
| Opposite Gender Mentor | -0.0123 | 0.8000 | .81 | -7.955 (.000) |
| Perceived Travel Benefits | 1.2300 | 1.4900 | .26 | -2.145 (.033) |
| Desire for Challenging Career | 1.9400 | 2.3400 | .40 | -3.463 (.001) |
| Exposure to Non-Traditional Gender Roles at Young Age | 0.0859 | 0.7800 | .69 | -6.546 (.000) |
| Early Exposure to Aviation | 1.5500 | 0.9600 | -.59 | 3.906 (.000) |
| Desire for a Technical Profession | 1.1700 | 0.8900 | -.28 | 2.304 (.022) |
| Cost of Required Training/Education | -0.4900 | -0.9900 | -.50 | 3.660 (.000) |
| Peer Support | 0.5700 | 0.8200 | .25 | -2.302 (.022) |
| Exposure to Aviation Mystique | 0.7200 | 0.4000 | -.32 | 3.016 (.003) |
| Support and Encouragement of Flight Instructor(s) | 0.9400 | 1.5600 | .62 | -5.026 (.000) |
| Military Career Potential | 1.1000 | -0.0235 | -1.12 | 7.727 (.000) |
| Desire to Prove Personal Abilities | 1.5200 | 1.8700 | .35 | -2.927 (.004) |

Note: Difference in means is the male mean subtracted from the female mean.

Table 5 . *Comparison of Influence Factors with Statistically Significant Differences at the .05 Level*

| More Positive Influence For Men | More Positive Influence for Women |
|---|---|
| - Perceived Potential Income | - Desire to Pursue Non-Traditional Work Role |
| - Required High School Math and Science Courses | - Opposite Gender Role Model(s) |
| - Perceived as a Glamorous Profession | - Opposite Gender Mentor |
| - Perceived Technical Nature of Profession | - Perceived Travel Benefits |
| - Exposure to Science/Technology at Young Age | - Desire for Challenging Career |
| - Same Gender Mentor | - Exposure to Non-Traditional Gender Roles at Young Age |
| - Early Exposure to Aviation | - Peer Support |
| - Desire for a Technical Profession | - Support and Encouragement of Flight Instructor(s) |
| - Exposure to Aviation Mystique | - Desire to Prove Personal Abilities |
| - Military Career Potential | |

identify factors that have tended to motivate males and females to become professional pilots. Although it also identified some factors that might have a negative influence, it only identified one that might be considered to be a significant negative influence. However, this is probably not a shortcoming of the force-field analysis procedure but a shortcoming of this study. It was not possible to identify a group of people who decided not to become professional pilots. Therefore, the data were gathered from a group of people who became pilots and who therefore personally decided in the past that the positive factors outweighed the negative factors.

The study also indicated that although men and women seem to be affected by the same factors, some are more important to men and some are more important to women. Although people have suggested this in the literature studies have not been available to provide firm information on such differences. The discussion around Table 5 above presents those differences for men and women professional pilots.

The information generated from this study can have a major impact on the ways in which aviation personnel address the shortage of professional pilots. In the past, aviation educators and industry leaders have mainly tried to recruit both men and women at the same time. A new strategy of recruiting men and women separately, especially women, is now starting to emerge in the industry. A better understanding of the impact on career choice of the influence factors identified in this study could improve the effectiveness of both of these recruitment strategies.



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By examining the career choice influence factors identified as being common to both men and women, aviation educators and industry leaders should be able to focus their resources on recruitment strategies that will have more appeal to both men and women. However, the greatest increases in the numbers of both female and male pilots would more likely be obtained by developing recruitment strategies that appeal separately to men and to women. To do this, influence factors identified in this study where men and women differed significantly need to be considered in recruitment.

Some of the factors that were identified to be positive and negative influences on career choice in this study are familiar to aviation educators, but many are not. Past recruitment strategies have often revolved around the fun and challenge of flying, the potential income and lifestyle of being a pilot, and the cost of learning to fly. However, past recruitment efforts have not displayed an understanding of many of the other themes identified in this study such as, the importance of role models and mentors, the impact of perceived training requirements, peer support, and the desire for responsibility. To develop more effective recruitment strategies aviation educators need to become better informed about these less understood influence factors.

Literature on general and non-traditional career choice identified many of the same important influence factors as this study. For example, the importance of role models was identified as important in the literature and in this study. Aviation educators and aviation industry members should take note of the existing studies on career choice, along with the information found in this study, to help develop strategies for increasing the number of professional pilots. Intervention strategies suggested by researchers such as Jewett (1996) for providing role models and early exposure to mathematics, science, and technology could be helpful guides for increasing the number of men and women choosing careers as professional pilots.

Many items were also identified as having no or very little influence on professional pilot career choice. Identifying these factors can also be important. Given the limited resources available for recruitment, such information can be useful in discontinuing past practices that may have little influence.

The results of this study have general implications for the recruitment of personnel. They suggest that using force-field analysis it is possible to identify factors that positively and negatively occupational choice. They also suggest that some factors affect men and women differently. This information can be extremely valuable in encouraging people to enter occupations where there are critical shortages. Some examples of how the information might be used are: developing recruitment efforts around factors which influence both men and women, developing separate recruitment efforts for men and women, minimizing recruitment efforts focused on factors not found to be significant, and trying to remove factors that have a negative influence. With knowledge generated from a study of this type, the effectiveness of recruitment efforts can be significantly increased.

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# Decision-making Processes in Novice and Expert Airplane Pilots

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*Subjects were interviewed about their decision-making processes as they related to four aeronautical decision-making scenarios. Experts exhibited characteristics and themes that differed noticeably from that of the novices. One of the more pertinent differences involved what some writers have referred to as cognitive maps. These mental guides appeared to be used effectively by experts in attempting to cope with problems associated with decision-making scenarios. Novices also appeared to make use of cognitive maps in their decision-making processes. Their maps, however, were primitive in comparison to the experts and resulted in difficulties when attempting to address specific scenarios.*

Keywords: Decision-making, Novice, Expert

General Aviation (GA) includes all aviation activities that are not directly related to either the military or the airlines. Both the military and commercial airlines have stressed formal decision-making training in their initial and recurrent pilot training programs. Such has not, however, been the case in GA. Although the Federal Aviation Administration (FAA) has mandated that aeronautical decision-making (ADM) be included in GA training programs, there are few current guidelines regarding the scope of such training. In addition, there is little specific information related to the conditions under which such training could best be delivered.

Judgment errors among GA pilots are well documented (e.g., Jensen and Chappell, 1983; National Transportation Safety Board, 2000). These errors have contributed to numerous accidents, injuries and fatalities. This study reviewed the decision-making processes of expert and novice aviators. It identified differences and suggested activities that could be incorporated into a Private Pilot Ground School (PPGS) course to assist novices in becoming better decision-makers.

The type of decision-making most pertinent to aviation-related activities has been referred to by numerous writers (e.g., Kaempf and Klein, 1994; Stokes, Kemper and Kite, 1997) as *naturalistic decision-making* (NDM). This particular type of decision-making, according to Orasanu and Connolly (1993), is characterized by decisions made under stress and involve ill-structured problems in which the decision-maker must react quickly in a dynamic and uncertain environment.

## Problem Statement

There has been little written about decision-making and GA student pilots. Most of the more recent ADM studies (e.g., Driskill, Weissmuller, Quebe & Hand, 1998; Kochan, Jensen & Chubb, 1997; Stokes, Kemper and Kite, 1997) involved subjects with considerably more experience than that of the typical student pilot (under 100 hours of flying time). This study identified the ADM weaknesses of student pilot subjects and the ADM proficiencies of expert pilot subjects.

Two assumptions were made. First, it was assumed that the "expert" pilots were representative of experienced professionals. Second, it was assumed that the ADM written and video scenarios, that were used to obtain data, served as practical surrogates for pre-flight and in-flight experiences of the subjects.

Although most of the ADM literature originates from the discipline of psychology, this study was viewed through the lens of an educator and certified flight instructor. Nevertheless, this study examined some of the cognitive processes as they related to ADM. The primary emphasis of the study was to better understand the thought processes of student and expert subjects and to use the data to help student pilots develop a practical foundation in ADM.

The research question explored the differences in pre-flight and in-flight decision-making processes between novice and expert subjects. The study determined that significant differences did exist. These differences are summarized in Figure 1.

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*Figure 1. Expert and Novice ADM Themes and Characteristics*

| Experts | Novices |
|---|---|
| Established the Context<br>•identified general framework within which each scenario occurred | Hazardous Attitudes:<br>•Invulnerable<br>•Impulsive<br>• Macho<br>•Tendency to permit "outside factors" to affect ADM processes |
| Defined the Situation<br>•acquired specific details regarding each of the scenarios | Interpretation of Risks:<br>•formed priorities without much analysis<br>•realization of inexperience but inconsistent application in practice<br>•recognition of few alternatives<br>•hesitant uncertain — often changed their minds |
| Prioritized Plans and Alternate Plans<br>•consistently prioritized actions and attempted to formulate back-up plans | Emphasis on Rules and Procedures:<br>•FAA<br>•Pilot's Operating Handbook<br>•flight and ground instructors<br>•ATC<br>•procedures acquired through self-directed learning |
| Recognized and Use of Familiar Experiences<br>•intuitive decisions based on accumulated knowledge and experiences | Recognition of Familiar Conditions:<br>•recognized familiar situations that subjects believed to be analogous to ADM scenarios<br>•made use of relevant ADM experiences to help resolve scenarios. |
| Assessed Risks<br>•assessed all risks pertinent to the scenarios | Information Acquired to Assess Risks:<br>•purposely limited volume of information acquired to resolve scenarios<br>•quality of information was often superficial or irrelevant |

Characteristics (•) are listed under each of the themes

**Method**

Four student pilot (SP) subjects were selected fom students enrolled in a PPGS course that was taught at Montgomery County Airpark, Gaithersburg, MD. Two preliminary studies were conducted during the Spring and Fall of 2000. During the preliminary studies it was determined that SPs needed to have acquired a minimum of flying time and experiences to be useful participants in the study. The minimum requirements for SPs, therefore, consisted of: a. twenty hours of flight time; b. soloed (subjects had flown an aircraft by themselves); c. currently involved in cross-country flight training; d. had acquired knowledge applicable to ADM scenarios (in PPGS and during flight training). All of the student subjects were males between the ages of twenty-one and thirty-eight.

Four expert pilot (EP) subjects were also selected for inclusion in the study. Criteria for their selection was based on several requirements that included: a. a minimum of five thousand hours of flight time; b. currently working as a professional pilot; c. had worked as a professional pilot in a minimum of two mediums (e.g., flight instructor, charter pilot, airline pilot, etc.). The researcher was fortunate to locate four EPs whose experience and flying time far exceeded these minimums. All of the expert pilots were males between the ages of thirty-six and sixty-two.

The data for the study was acquired through interviews of the subjects. The interviews were based on three ADM written scenarios and one video scenario. The written scenarios were selected from fifty-one ADM scenarios contained in an FAA study (Driskill, Weissmuller, Quebe, Hand and Hunter, 1998). The written scenarios were revised during the pilot studies to include more variables that would, it was assumed, be useful in eliciting additional information fromthe subjects. Two of the written scenarios involved in-flight decision-making. One of the written scenarios involved pre-flight decision-making. The video scenario (FAA, 1991), included both pre-flight and in-flight decision-making segments.

Each of the subjects was presented with the three ADM written scenarios. The first part of each interview consisted of the subject's general reaction to the scenario. A variety of topic areas were compiled by the researcher



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into an Interview Guide that was used to help focus the conversation on pertinent issues. The second part of the interview consisted of presenting the subjects with four written alternatives. The subjects were asked to rank order the alternatives and to explain their reasons for ranking the alternatives as they did. An example of one of the scenarios used in the study is presented in Figure 2.

*Figure 2. Scenario 3: Presented to Students and Expert Subjects*

You are at a small airport with minimal facilities and at the end of your walk around pre-flight, the flaps refuse to retract from 30 degrees. It was a planned two hour flight back to your home airport. The weather, which was good, seems to be deteriorating with higher winds and lower ceilings than were forecast. A friend, who is a student pilot, at your home airport, has scheduled your aircraft for his Private Pilot flight test with the FAA in four hours. An airport attendant (who is not a mechanic) says he has seen this problem before and states that the "limit switch is stuck." There is no Airframe and Powerplant (A&P) mechanic at this airport, but there is an A&P mechanic at an airport 35 miles away. The attendant says he knows where a switch for this exact model aircraft can be quickly picked-up and he could install it. He says he also could reach up through the inspection port and free the switch enough to raise the flaps but cannot guarantee they will work when airborne. You call the flight school and get their answering machine. You are on your own. You decide to:

| *Rank Order* | *Alternative* |
|---|---|
| 1 2 3 4 | a. leave the flaps down and fly to the nearby (35 miles) airport and have a certified (A&P) mechanic fix the problem |
| 1 2 3 4 | b. have the attendant reset the switch, get the flaps up and fly home. |
| 1 2 3 4 | c. have the attendant change the switch, check it out then fly home and have the flight school's mechanic inspect the work |
| 1 2 3 4 | d. wait until the flight school can fly an A&P mechanic in and change the switch |

The response format for the video scenario was also changed from what had been done during the initial pilot study. The first portion of the video scenario involved pre-flight actions. This was followed by an in-flight section. During the pilot studies, it was determined that stopping the video after each segment (pre-flight and in-flight) and interviewing the subjects about each portion of the video independently, resulted in an increase in the quantity and quality of data.

The data acquired during the interviews was transcribed and coded by the researcher. Open coding, a process that involves fracturing the data, was followed by axial and selective coding as described by several writers (e.g., Strauss and Corbin, 1998; Yin, 1994). The identification of characteristics and general themes began to emerge during that process. The characteristics and themes were subjected to peer review during several *coding seminar* sessions.

The research design sought to establish the pre-flight and in-flight decision-making characteristics and themes of student pilot and expert pilot subjects. The design also sought to make direct comparisons. These comparisons included: a. SP pre-flight with SP in-flight; b. EP pre-flight with EP in-flight; c. SP pre-flight with EP pre-flight; d. SP in-flight with EP in-flight; e. SP in-flight with EP pre-flight and f. SP pre-flight with EP in-flight.

**Relating Findings to the Literature**

Numerous researchers (e.g., Cannon-Bowers, Salas & Pruitt, 1996; Orasanu and Connolly, 1993; Simon, 1981, etc.), have written about NDM. This type of decision-making is characterized by "real world" conditions in which dynamic environments, time constraints, stress and uncertainty affect one's thought processes. The subjects in this study were presented with scenarios that included such conditions. The extent to which the subjects were able to cope with the issues inherent in the scenarios was dependent on their respective experience levels, training and knowledge of the subjects. Overall, and not surprisingly, the EP subjects were better able to cope with issues included in the scenarios than were the SP subjects. One of the possible explanations for the superior judgment abilities of EPs in naturalistic settings was what some writers (e.g., Craig, 1998; Klein, 1997; Stokes, Kemper & Kite, 1997) have referred to as "recognition-primed decision-making" (RPD).

RPD was described by Klein (1997) as a process in which decision makers used a combination of knowledge, experiences and wisdom to make intuitive judgments. He emphasized that accumulated experiences were important and significant factors in helping make quick and effective decisions. Klein explained that these experiences helped decision makers recognize important "cues" that were used as guides for developing responses to specific problems.

It was apparent that the EP subjects made use of their experiences in addressing the issues inherent in the scenarios presented to them during their interviews.

Another useful explanation for the superior judgment abilities of EPs in naturalistic environments involves the concept of "cognitive maps." Tolman (1948) in his experiments with rats, stated that:

> The stimuli, which are allowed in, are not connected by just simple one-to-one switches to the outgoing responses. Rather, the incoming impulses are usually worked over and elaborated in the central control room into a tentative, cognitive-like map of the environment ( p. 191).

Cognitive maps have been used by numerous researchers (e.g., Csanyi, 1993; Laszlo, Artigiani, Combs and Csanyi, 1996) to examine behaviors and to explain the resolution of problems in a variety of settings. Laszlo, et al. defined cognitive maps as:

> ...mental representations of the worlds in which we live. They are built of our individual experiences, recorded as memories and tested against the unceasing demands of reality. These maps, however, do not simply represent the worlds of our experiences in a passive and unchanging way. They are, in fact, dynamic models of the environments in which we carry out our daily lives, and as such determine much of what we expect, and even what we see. Thus, they represent and at the same time participate in the creation of our experience of reality itself ( p. 3).

Student subjects in this study appeared to make use of mental maps in their thought processes. The cognitive maps of SP subjects, however, were primitive in comparison to those of the experts. Although the SP subjects attempted to rely on pertinent experiences, their maps were rudimentary and consisted of numerous gaps. Many of these cognitive gaps could have contributed to the presence of several observed characteristics that included; uncertainty, inability to recognize alternatives, an emphasis on rules and procedures and the presence of hazardous attitudes.

In contrast, the cognitive maps of EPs in this study appeared to be significantly more developed. The experts were able to quickly make connections between problems presented in the scenarios and their experiences. These experiences provided them with a more detailed map and enabled them to find alternate routes to a desired end. The result was that they were able to quickly and effectively formulate viable alternatives. For example, one expert pilot, reflecting on an electrical problem that almost resulted in an accident remarked:

> *But you know, you know from your experiences you learn to look for certain things and do certain things. You know, I know if I have a flickering light on a display, I'm gonna look real close at those alternators. Make sure they're charging; make sure the battery is charging.*

When experts were unable, because of time constraints, to rely on their cognitive maps they were quick to rely on another process that some writers (e.g., Jensen, 1995) have referred to as "satisficing." The concept of "satisficing" involves making decisions within the time constraints of a naturalistic environment. It involves choosing a course of action that, while not the absolute best alternative, would not necessarily result in negative consequences and would represent a viable option. During interviews with expert subjects, several related incidents in which a "satisficing" based response was evident.

Student subjects were unable to depend heavily on either cognitive maps or the concept of "satisficing" to resolve problems. Student subjects, therefore, tended to rely on established procedures. In addition, they frequently exhibited *hazardous attitudes* that had the effect of making a bad situation worse.

Diehl, Hwoschinsky, Lawton & Livak (1987) identified five *hazardous attitudes*. They included: a. anti-authority (not willing to comply with rules and regulations); b. impulsiveness (acting quickly without thinking); c. invulnerability (refusing to believe that negative events could occur); d. macho (overestimating one's competencies) and e. resignation (giving up — taking no action to improve a situation). During student subject interviews, three of these attitudes (impulsiveness, invulnerability and macho) were evident on numerous occasions. In addition, SPs demonstrated another dimension that I included as a *hazardous attitude*. That dimension was their tendency to allow "irrelevant factors" to influence their decision-making processes. None of the EP subjects revealed any of the hazardous attitudes during their respective interviews.

Two of the five hazardous attitudes were not observed during interviews with student subjects. None of the SPs displayed *resignation* during their interviews. In addition, the *anti-authority* hazardous attitude was not only absent but, to the contrary, student subjects were concerned about assuring they followed guidelines and procedures

and did not break any rules. This appears to confirm the findings of Dreyfus & Dreyfus (1986) who wrote about one's journey from novice to expert. Dreyfus & Dreyfus stated that this journey consisted of specific stages.

The Dreyfus' termed the first part of this journey as the *novice* stage. The writers stated that this initial level was characterized by learners receiving initial instruction in a particular subject. They also indicated that learners in this stage typically relied on facts and guidelines presented by their instructors without much regard to the context within which the situation (or scenario) occurred. The SP subjects were representative of the *novice* stage of the Dreyfus model. They consistently relied on established guidelines and procedures. In addition, the student subjects often relied on specific lessons that were either taught by their instructors or acquired through independent study.

**Findings**

There were differences in the decision-making characteristics of expert and student subjects. These differences are depicted in Table 1. The EP subjects in this study exhibited similar ADM thought processes as did experts in previous studies (e.g., Dreyfus and Dreyfus, 1986; Stokes, Kemper and Kite, 1997). They were quick to recognize cues from their experiences to help resolve scenarios. It was apparent that their respective *cognitive maps* served as useful and effective guides. For example, prior to making their "go-no/go" decision, EP subjects exhibited detailed pre-flight planning that included everything from reviewing the legal aspects of a planned flight to the cumulative effects of fatigue and stress. The SP subjects ignored these important pre-flight considerations.

The expert subjects also attempted to place each of the scenarios in its larger context. They frequently asked questions to assure they completely understood the overall framework within which the scenarios occurred.

Table 1. *Differences in Expert and Novice Pre-flight and In-flight Decision-making*

| Comparison | Differences in Decision-making Characteristics |
|---|---|
| SP Pre-flight and In-flight | -Limited number of items to consider while In-flight, but not in Pre-flight<br>-Made Attempts to calm down and take time to assess risks while In-flight, but not in Pre-flight |
| EP Pre-flight and In-flight | -Sought information only from qualified individuals in Pre-flight ADM<br>-Considered effects of stress and fatigue during Pre-flight ADM |
| SP and EP Pre-flight | -SPs: inadequate information - adhered to rules and procedures – exhibited Hazardous Attitudes<br>-EPs: Sought information only from qualified individuals – planned diligently (detailed analysis of all pertinent issues) |
| SP and EP In-flight | SPs: recalled experiences they believed to be helpful – recognized few alternatives – purposely limited number of items to consider<br>EPs: used prior experiences to help resolve problems – prioritized plans and back-up plans |
| SP In-flight and EP Pre-flight | SPs: hesitant and uncertain - stressed importance of calming down and take time to assess risks<br>EPs: considered effects of stress and fatigue – ignored options that they believed involved excessive risks |
| SP Pre-flight and EP In-flight | SPs: adhered to rules and procedures – realized their inexperience but nevertheless chose demanding and sometimes dangerous alternatives (hazardous attitudes)<br>EPs: established the general context within which the scenario existed - defined the specific conditions of the scenario – reluctant to depend on others (self-reliant) |

In addition, the experts asked numerous questions about each of the scenarios in an attempt to acquire as many specific details as possible.

Student subjects, responding to in-flight decision-making scenarios, frequently attempted to limit the amount of information available for processing. Two SPs remarked that they did not want to be "overloaded" with information. This sometimes resulted in SPs stressing information that was not particularly pertinent while ignoring factors that were relevant. Several of the student subjects also talked about trying to "calm down" while attempting

to resolve in-flight decision-making scenarios and discussed methods (e.g., departing the traffic pattern at an airport) to allow themselves time to determine an appropriate course of action.

Student subjects stressed rules and procedures in their responses to issues related to the scenarios. These rules and procedures emanated from a variety of sources including: a. pilot's operating handbook; b. Air Traffic Control; c. FAA rules and regulations; d. guidelines established by flight and ground instructors and e. procedures and guidelines obtained during self-directed learning. In addition, the student subjects often hesitated in attempting to chose an alternative and frequently changed their minds.

All of the SP subjects, in their responses to decision-making scenarios, demonstrated hazardous attitudes. Even though they seemed to recognize the fact that they were inexperienced, and attempted to abide by rules and guidelines, SP subjects often chose alternatives that involved difficult and sometimes even dangerous options. The student subjects also frequently elected to chose alternatives without acquiring all pertinent information. This could be a result of their incomplete cognitive maps.

**Need for Further Research**

This study established differences between the ADM characteristics of expert and novice subjects. The study did not, however, result in findings necessarily generalizable to a larger population of pilots or to decision-making in other contexts. Additional research will be required to accomplish that goal. A variety of additional studies could prove beneficial.

A quantitative study, including relatively large numbers of student pilot subjects, could build on the findings of this study. For example, such a study could measure (via. pre-tests and post-tests) the presence of *hazardous attitudes* (or other attributes) among student pilots. Acceptable subjects would be divided into a control group and a treatment group that received ADM training within, for example, the context of a Private Pilot Ground School (PPGS). In addition, it would be interesting to note how those involved in such a study progressed in their respective careers as pilots. Although challenging to conduct, such a longitudinal study could reveal important data related to the value of ADM training received early in one's flying career.

As noted previously, all of the SP subjects had displayed hazardous attitudes in their ADM thought processes. None of the EP subjects displayed such attitudes. Was this due exclusively to the differences in the relative experience levels of the subjects? Additional research will be needed to confirm that assumption and to identify specific training methods that could prove productive in reducing hazardous attitudes. In addition to the hazardous attitudes noted by numerous writers (e.g., Berlin, Gruber, Jensen, Holmes, Lau, Mills & O'Kane, 1982; Diehl, Hwoschinsky, Lawton & Livak, 1987) I included a tendency to rely on *outside factors* (factors that have no relevant bearing on a particular problem) as a hazardous attitude. The extent to which these *outside factors* affect decision-making of novice pilots, and what can be done to eliminate them, remains to be discovered.

The use of simulators, rather than written and video scenarios, could also be useful in obtaining data from subjects. Although ADM studies involving simulators had been done in the past, (e.g., Connolly, 1990; Stokes, Kemper & Kite, 1997) none of the subjects involved student pilots (students who had not earned their private pilot licenses). Providing subjects with ADM scenarios in simulators as student pilots could prove to be useful both to the researcher (in acquiring data) and also to the subjects (whose ADM experiences could result in a more profound and lasting impression).

As stated previously, the student subjects in this study had all soloed and had begun their cross-country flight training. In addition, all of the student subjects had acquired a minimum of twenty hours of flying time and had received flight and ground instruction in subject matter pertinent to the written scenarios. One wonders, however, if the results would have been different had the student pilot subjects been more experienced. For example, would the findings have been different had the student pilot subjects consisted of those who had completed their cross-country training, ground school training and were in the process of preparing for their Private Pilot flight test with the FAA?

The concept of *cognitive maps*, as they relate to expert and novice ADM is another area in need of additional research. The evolution of such maps and methods to assist novices in their development could produce useful data. In addition, it would be interesting to examine individuals who are pre-disposed to developing cognitive maps. Determining the characteristics of such individuals and the basis of their pre-dispositions could yield important insights into helping students acquire the ADM skills of experts.

Two of the student subjects discussed how they had read a variety of publications (e.g., books, magazine articles, etc.) that they assumed had helped them become better decision-makers. These readings were in addition to the required readings related to the PPGS course in which they were enrolled. One of these self-directed learners (SP3) appeared to be more proficient than the other subjects in coping with the scenarios presented in the study. A study involving the role of self-directed learning in the acquisition of ADM skills could prove enlightening. It

would also be interesting to note whether there was a relationship between those who were prone to self-directed learning and those who were predisposed to forming and using cognitive maps. One could also study the relationship and possible correlations of those attributes to the acquisition of ADM competencies.

It would also be interesting to determine whether this research has wider applications. Research involving expert and novice decision-making in naturalistic environments could have many possible applications. For example, one might consider conducting research among fire-fighters or police officers. In addition, one might acquire useful information from expert and novice managers or administrators, in a variety of settings, who find themselves in environments characterized by time constraints, stress and problems that are difficult to define.

**Recommendations**

The data obtained in this study made it clear that there were notable differences in the pre-flight and in-flight ADM thought processes of expert and novice subjects. Furthermore, the study demonstrated that expert subjects, in naturalistic settings, relied on their cognitive maps to assist them in coping with issues in each of the scenarios. It seemed clear that the student subjects would benefit from training designed to assist them in developing more detailed and comprehensive cognitive maps. The specific components of such training could be based on the research of numerous writers.

For example, several researchers (O'Byrne, Clark and Malakuti, 1997) suggested methods to assist novices in acquiring the skills of experts. Generally, the researchers emphasized that such programs should stress both basic principles and theories as well as opportunities to apply these principles and strategies to realistic and relevant scenarios. Other researchers (Dreyfus and Dreyfus, 1979), in their research related to training pilots to cope with emergency situations, emphasized that effective training must be based on specific contexts. The writers suggested that pilots should be exposed to a large number of relevant scenarios to enhance their abilities to recall appropriate courses of action. Wiggins (1997) stressed that teaching cognitive skills to novice aviators was vital to their development. He stated that such cognitive training could include such activities as protocol analysis (thinking aloud while performing a task) and the analysis of errors (reviewing accident reports). These suggestions could potentially serve as effective cognitive map builders and assist novices in both pre-flight and in-flight ADM.

As previously mentioned, *hazardous attitudes* are well documented in the literature and were apparent in all of the SP subjects involved in this study. Accordingly, a discussion of these attitudes that includes their causes and possible remedies should be included early in the PPGS and could serve as an excellent introduction to the ADM portion of the PPGS. If possible, instructors should also attempt to include scenarios that demonstrate these hazardous attitudes.

**Conclusion**

Furnishing students with the knowledge necessary to pass an FAA examination has always been the primary focus of PPGSs. A PPGS could also, however, provide students with a unique opportunity to enhance their ADM competencies. By substituting knowledge, in the form of ADM scenarios, for actual experiences, instructors could help students form more extensive and relevant cognitive maps. The enhancement of such maps could prove to be just as important and, perhaps, even more important than any specific topic covered in a PPGS. It is essential, therefore, that instructors consider including ADM training along with relevant scenarios within the context of PPGSs and other ground based, aviation-related courses. It is a pursuit worthy of our time, patience and best efforts.

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